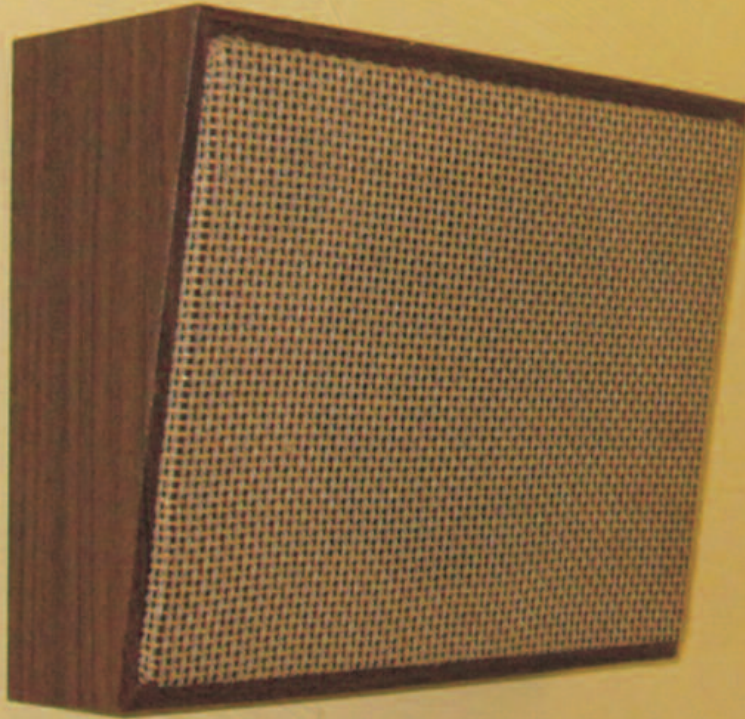# ELECTRONIC MUSICAL DOORBELL

This is an old project that we still use today. The chip has 12 different melodies. It is set so that each time the doorbell switch is pressed, a different tune plays. It's quite loud. I'm not including the schematic drawing because I don't have one. I don't remember how I designed these circuit boards and did not include the drawing. Perhaps I simply used the drawing that came with the chip. It was purchased from Radio Shack. This is 9-2013. The circuit was built in 1995. It's almost 18 years old. We have a teenager!

I have a little tale about this project. Late one night while everyone was in bed, we heard a loud pop. We got up to investigate but couldn't find anything amiss. Sometime afterwards, we realized that the door bell wasn't working. I took it down and was surprised to find that the 35 volt capacitor had exploded! You can see it is now a 50 volt capacitor!

My first printed circuit board project had something to do with model railroading. I used a hobby knife to cut away the copper to create the traces! I'm certain that this project was done with either brush on laquer or an etch-resist pen. I'm not taking it down to look!

I found a copy of the schematic, albeit not the one for this doorbell, but the chip. I have included it.

Doorbell by
Lennie Zink
12-1995
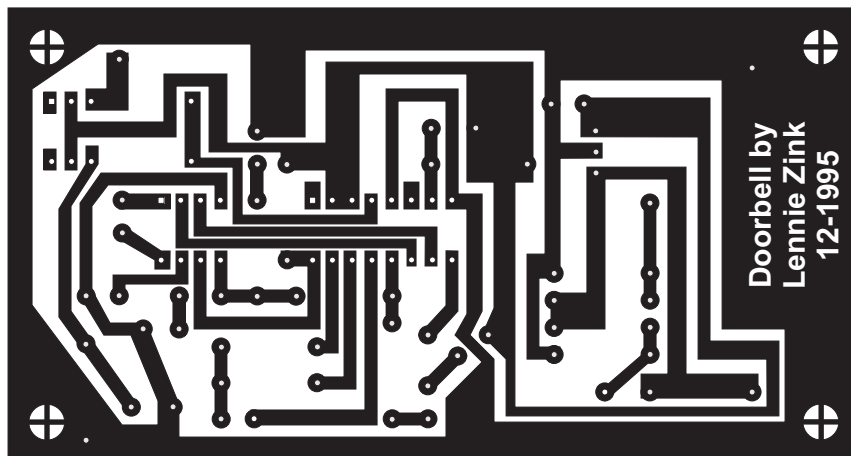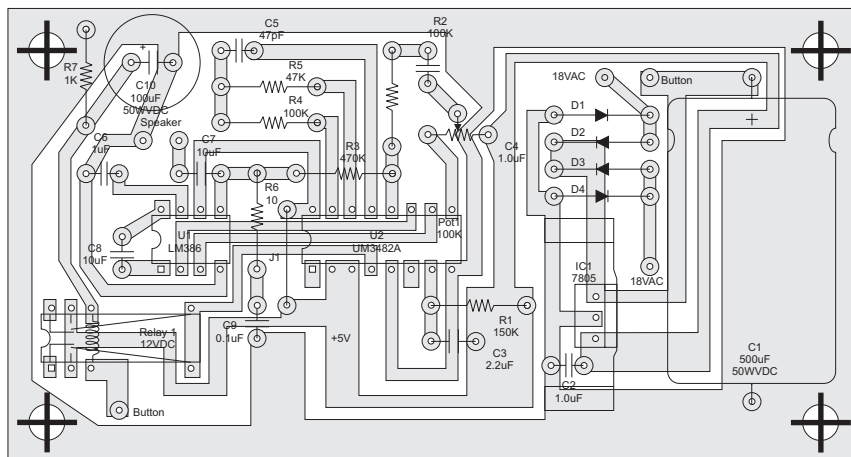
TECHNICAL DATA

AN EXCLUSIVE RADIO SHACK SERVICE TO THE EXPERIMENTER

UM3482A Melody Generator

General Discription

The UM3482A is a mask-ROM-programmed multi-instrument melody generator, implemented in the CMOS technology. It is designed to play melodies according to programmed information and is capable of generating 12 songs with 3 instrument sounds, the piano, the organ and the mandolin.

The device also includes a pre-amplifier which provides simple interface to the driver circuit. The UM3482A is intended for applications such as toys, door bells, music boxes melody clock/timers and telephones.

Features

- Powered by a 1.5V battery
- Low stand-by current
- 12 songs
- Play all the songs repeatedly or auto stop
- Play one song only, repeatedly or auto stop
- Every song starts from the first note
- On chip envelope modulator and pre-amplifier

Absolute Maximum Ratings*

DC supply voltage .... $-0.3V$ to $5.0V$
Input/output voltage .... V_{SS} $-0.3V$ to V_{DD} $+0.3V$
Operating ambient temperature .... $-10°C$ to $60°C$
Storage temperature .... $-55°C$ to $125°C$

* Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics

V_{DD} = 1.5V V_{SS} = OV Temperature = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Conditions
Operating voltage	V_{DD}	1.35V	1.5V	5V	
Stand-by current	I_{STB}	0.1μA	—	12μA	OSC halting
Input voltage-high	V_{IH}	$V_{DD} - 0.3V$	—	V_{DD}	
Input voltage-low	V_{IL}	V_{SS}	—	$V_{SS} + 0.3V$	
Input current high	I_{IH}	1.5μA	3μA	6μA	$V_{IH} = V_{DD}$
Input current low	I_{IL}	—	—	0.1μA	$V_{IL} = V_{SS}$
ENV PIN drive current	I_{ENV}	500μA	—	—	$V_{ENV} = 0.8V$
Output current (OP1)	I_{OL}	200μA	—	1200μA	$V_{OL} = 0.8V$
Output current (OP2)	I_{OH}	200μA	—	1200μA	$V_{OH} = 0.7V$

Pin Assignments & Functions

| PIN	Assignments	Descriptions
1	TSP	Output flag of melody auto stop. In normal operating this pin should be open
2	CE	Chip enable if connected to V_{DD}. Chip disable if connected to V_{SS}
3	LP	The melody plays only one song if this pin is connected to V_{DD}. The melody plays all songs if this pin connected to V_{SS}
4	SL	A positive going edge applied to this pin the melody will change to the next song
5	$\overline{AS}$	The melody will be repeated if this pin connected to V_{DD}. The melody will be auto stop if this pin connected to V_{SS}
6	NC	No connection.
7	ENV	Envelope circuit terminal.
8	V_{SS}	Negative supply power.
9	MTO	Modulated tone signal output.
10	OP1	Pre-amplifier output 1.
11	OP2	Pre-amplifier output 2.
12	MTI	Modulated tone signal input to the pre-amplifier.
13	OSC3	Pin 13-15 can be connected as an RC oscillator. External oscillating signal can be input to Pin 15.
14	OSC2	
15	OSC1	
16	V_{DD}	Positive power supply.

Program Truth Table

Items	CE	SL	LP	AS	Program
1	0	X	X	X	Stand-by
2	1	0	0	0	Start from first melody → last melody → stop
3	⌐	0	0	1	Start from first melody → last melody → repeat from first melody
4	⌐	0	1	0	Start from the preset melody → stop
5	1	0	1	1	Repeat the present melody
6	1	⊓	0	0	Change to the next melody → last melody → stop
7	1	⊓	0	1	Change to the next melody → last melody → repeat from first melody
8	1	⊓	1	0	Change to the next melody → stop
9	1	⊓	1	1	Change to the next melody → repeat the same melody

Selections:

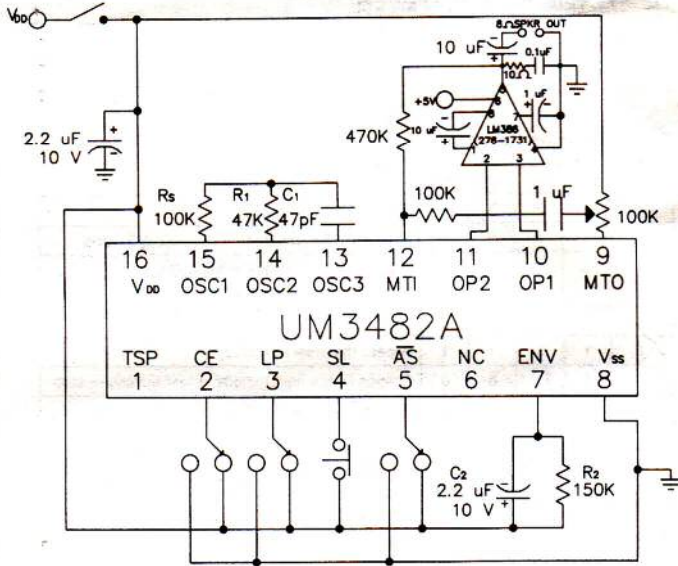|	
AMERICAN PATROL	ARE YOU SLEEPING
RABBITS	HAPPY BIRTHDAY
OH, MY DARLING CLEMENTINE	JOY SYMPHONY
BUTTERFLY	HOME SWEET HOME
LONDON BRIDGE IS FALLING DOWN	WIEGENLIED
ROW, ROW, ROW YOUR BOAT	MELODY ON PURPLE BAMBOO

### Block Diagram
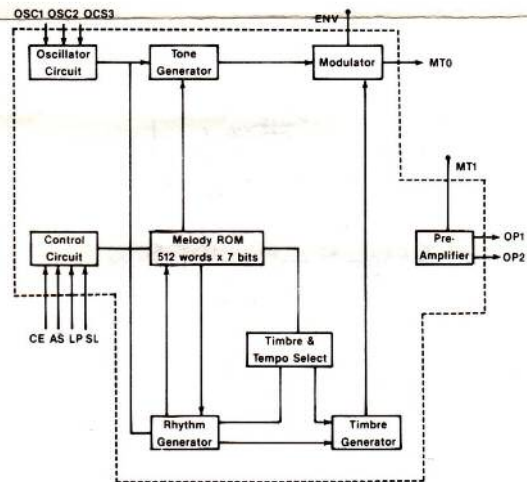
Pin Assignment
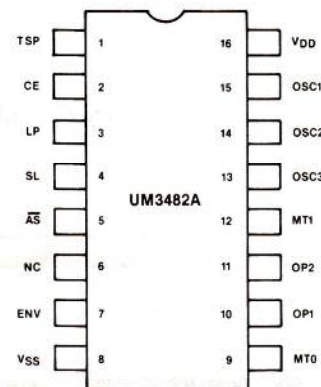
General Application

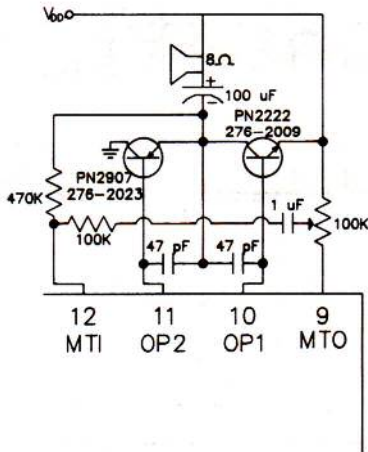## Chime Function Application

Oscillator & Control Circuit

The resistor R_1 & capacitor C_1 are connected externally to set the frequency at 100 KHz. Addition of R_S in series with input inverter makes the circuit less sensitive to variations of supply voltage. Under the standby condition (CE is Low) the operation of the OSC is inhibited. As soon as a high level signal is applied to the CE terminal the circuit starts oscillating. Since the OSC frequency is used as a time base of the tone, rhythm and tempo generators, its accuracy will affect the quality of the melody.
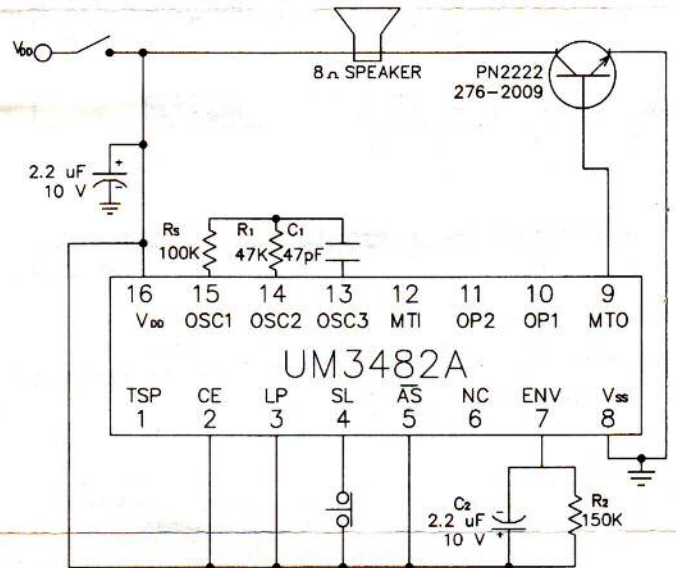
Modulator Circuit

The tone signal and the timbre signal are put through the modulator circuit. The output wave is shown below. Proper selection of C_2, R_2 can produce envelopes of desired charging and discharging time.

Piano effect   Organ effect   Mandolin effect

Waveform at MTO.
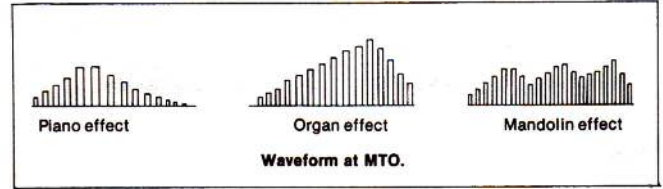
Alternative Amplifier Section

Low Cost Application